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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/696,052

10/28/2003

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SP02-227

5896

22928 7590 08/04/2009
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EXAMINER

LEUNG, JENNIFER A

ART UNIT

PAPER NUMBER

1797

MAIL DATE

DELIVERY MODE

08/04/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/696,052	Applicant(s) CAZE ET AL.	
	Examiner JENNIFER A. LEUNG	Art Unit 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 and 6-29 is/are pending in the application.
- 4a) Of the above claim(s) 3,4,10-13 and 19-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,6-9,14-18 and 26-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on March 30, 2009 has been carefully considered. The changes made to the Specification are acceptable. Claim 5 has been canceled. Claims 3, 4, 10-13, 19-25 are withdrawn. Claims 1, 2, 6-9, 14-18 and 26-29 are under consideration.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1, 2, 6, 8, 9, 14-18 and 26-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morse et al. (US 6,960,235) in view of Burdon et al. (US 6,572,830).

Regarding claims 1, 2, 14, 15, 26 and 27, Morse et al. discloses a microstructure (see FIGs. 1-5) comprising:

a plurality of microchannel walls defining at least one microchannel **6**, wherein at least one of the plurality of microchannel walls further comprises a porous membrane **12/13**; and

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at least one coating layer including a catalyst support and a catalyst (i.e., a coating of catalyst materials including platinum, platinum-ruthenium, nickel, palladium, copper, copper oxide, ceria, zinc oxide, alumina, combinations thereof, and alloys thereof, see column 5, line 65 to column 6, line 1. The examiner takes Official Notice that metal oxides such as alumina are well known in the art as a support material for the metal catalysts of platinum, platinum-ruthenium, nickel, palladium and copper);

wherein the coating layer is adhered to interior surfaces of the plurality of microchannel walls, including the wall comprising the porous membrane **12/13** (i.e., the catalyst materials can be imbedded within the membrane *and* the microchannel by various coating methods; see column 6, lines 1-9; see also column 3, lines 37-48).

Morse et al. appears to suggest that the coating layer coats all of the interior surfaces of the at least one microchannel **6**. And, even if this were not the case, the examiner takes Official Notice that it would have been obvious for one of ordinary skill in the art at the time the invention was made to coat all of the interior surfaces of the at least one microchannel **6** of Morse et al. with the coating layer, to predictably enhance the catalytic activity by providing an increased surface area for interaction between the chemicals to be processed and the catalyst of the coating layer.

Morse et al. further discloses that the plurality of microchannel walls comprise glass (i.e., substrates **4a**, **4b** and membrane **12/13** may be made of glass; see column 2, lines 49-63). Morse et al., however, fails to disclose a “consolidated fired frit” of glass.

Burdon et al. teaches an apparatus comprising a plurality of microchannel walls defining at least one microchannel (see page 18, lines 16-20). The apparatus may be configured for

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chemical processing, by providing at least one coating layer comprising a catalyst on the microchannel wall (see FIG. 14; page 36, line 26 to page 38, line 16). In particular, Burdon et al. teaches microchannel walls comprising a consolidated fired frit of glass (i.e., green-sheets composed of particles of glass, dispersed in a polymer binder, and optionally with additives, are textured using various techniques to form desired structures, such as vias, channels or cavities. The green-sheets are then laminated and sintered together to form a substantially monolithic structure, defining the consolidated fired frit of glass; see page 16, line 17 to page 17, line 10; page 18, line 3 to page 19, line 9; page 22, line 9 to page 26, line 11).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute a consolidated fired frit of glass for the glass material forming the plurality of microchannel walls in the apparatus of Morse et al., because the formation of the glass material as a consolidated fired frit of glass would allow for simple fabrication of complicated three-dimensional structures, more efficient and reliable incorporation of functional components into the device, and facilitation of large-scale manufacturing of the devices, as taught by Burdon et al. (see page 9, line 18 to page 10, line 7).

Regarding claim 6, the modified apparatus of Morse et al. structurally meets the limitations set forth in this product-by-process claim because the claimed product is the same as, or obvious from, the product of the prior art. The determination of patentability is based on the product itself (i.e., at least one coating layer on at least one microchannel wall), and not its method of production (i.e., by slurry application). If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ

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964, 966 (Fed. Cir. 1985).

Regarding claims 8 and 9, Morse et al. disclosed that the catalyst material may include alumina (see column 5, line 65 to column 6, line 1). In addition, Morse et al. discloses that the catalyst material may be applied by various coating methods, including a sol gel doping method (see column 6, lines 1-9). Although Morse et al. is silent as to the specific steps in the sol gel doping method, and whether a sol binder is used in said method, the modified apparatus of Morse et al. nevertheless meets the limitations set forth in this “product-by-process” claim because the claimed product is the same as, or obvious from, the product of the prior art. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.

Regarding claims 16-18, 28 and 29, because the modified microstructure of Morse et al. comprises each of the claimed structural components, the microstructure will, inherently, be capable of operating under an internal pressure within the instantly recited ranges, absent a showing otherwise.

3. Claim 7 is rejected under 35 U.S.C. 103(a) as being obvious over Morse et al. (US 6,960,235) in view of Burdon et al. (WO 00/21659), as applied to claim 1 above, and further in view of Tonkovich et al. (WO 01/12312) and Haga et al. (US 2001/0016188).

Morse et al. does not specifically disclose a plurality of coating layers.

Tonkovich et al., however, evidences that the provision of a layer *or layers* of catalyst

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material or materials, as appropriate for a given catalytic reaction, would have been a conventional design consideration in the art (see page 11, lines 25-29).

In addition, Haga et al. teaches the provision of a plurality of coating layers (see FIG. 1A-C, 2A-C, 3A-B) for catalyzing a reforming process, so that the partial oxidation reaction, and not an external heat source, generates the necessary heat for conducting the endothermic steam reforming reaction.

It would have been obvious for one of ordinary skill in the art at the time the invention was made to configure the at least one coating layer as a plurality of coating layers in the modified apparatus of Morse et al., because the provision of a plurality of coating layers, as appropriate for a given catalytic reaction, would have been a conventional design consideration in the art, as evidenced by Tonkovich et al. Furthermore, the provision of a plurality of coating layers, as in Haga et al., would allow for the partial oxidation reaction, and not an external heat source, to generate the necessary heat for conducting the endothermic steam reforming reaction.

4. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being obvious over Morse et al. (US 6,960,235) in view of Burdon et al. (WO 00/21659), as applied to claim 1 above, and further in view of Haas-Santo et al. (*Preparation of microstructure compatible porous supports by sol-gel synthesis for catalyst coatings*).

Morse et al. disclosed that the catalyst material may include alumina (see column 5, line 65 to column 6, line 1). In addition, Morse et al. discloses that the catalyst material may be applied by various coating methods, including a sol gel doping method (see column 6, lines 1-9). Morse et al., however, does not specifically disclose that the catalyst support comprises an alumina sol.

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Haas-Santo et al. teaches an alumina sol, suitable for coating a microstructure reactor, wherein the alumina coating formed from the alumina sol is used as a catalyst support in the microstructure reactor (page 91, section 5.4. *Coating of a microstructure reactor*).

It would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute the catalyst support as taught by Haas-Santo et al. for the catalyst support in the modified apparatus of Morse et al., because the alumina sol used for forming the catalyst support exhibits low viscosity and high surface enhancement factors essential for the coating of small channels, and the sol-gel technique of Haas-Santo et al. produces a stable and well sticking, porous thin coating having a high specific surface (page 91, section 6. Conclusion).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

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5. Claims 1, 2, 6-9, 14-18 and 26-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-17 of copending Application No. 11/016,093 (hereinafter designated '093). Although the conflicting claims are not identical, they are not patentably distinct from each other.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Regarding claims 1, 2 and 26, '093 similarly claims a microstructure comprising: a plurality of microchannel walls defining at least one microchannel (see claim 1); at least one coating layer adhered to the plurality of microchannel walls defining said at least one microchannel, the coating layer including a catalyst support and a catalyst (see claim 1); wherein the plurality of microchannel walls, as best understood, comprise a consolidated fired frit of a material consisting of glass (see claim 2; also, claims 10, 14, 17). '093 similarly claims that at least one of the plurality of microchannel walls further comprise a porous membrane (see claims 3 and 4).

Regarding claims 6 and 27, the microstructure of '093 structurally meets the limitations set forth in this product-by-process claim because the claimed product is the same as, or obvious from, the product of the prior art. The determination of patentability is based on the product itself (i.e., at least one coating layer on at least one microchannel wall), and not its method of production (i.e., by slurry application). If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). In any event, '093 similarly claims that at least one coating layer is applied

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to the plurality of microchannel walls by filling the at least one microchannel with a slurry (see, for example, claims 10 and 17).

Regarding claim 7, '093 similarly claims that the at least one coating layer comprises a plurality of coating layers (see claim 5).

Regarding claim 8, '093 similarly claims that the catalyst support comprises a sol binder (see claim 1; also claim 10).

Regarding claim 9, '093 is silent as to claiming that the sol binder comprises alumina. In any event, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select an alumina sol binder for the sol binder in '093, on the basis of suitability for the intended use and absent a showing of unexpected results thereof, because the Examiner takes Official Notice that alumina is a well known and widely used catalyst support material in the art.

Regarding claims 14, '093 similarly claims that the catalyst comprises a material selected from the group consisting of groups IVA, VA, VIIA and VIII (see claim 8).

Regarding claim 15, '093 similarly claims that the catalyst comprises a material selected from the group consisting of platinum, nickel oxide, silicon carbide and silicon nitride (claim 9).

Regarding claims 16-18, 28 and 29, because the microstructure of '093 comprises each of the claimed structural components, the microstructure should, inherently, be capable of operating under an internal pressure within the instantly recited ranges, absent a showing otherwise.

6. Claims 1, 2, 6, 16-18 and 26-29 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-13 of copending Application No. 11/016,645 (hereinafter designated '645). Although the conflicting claims are not identical, they are not patentably distinct from each other.

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This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented. (It is noted that a Notice of Allowance was mailed in this application on July 24, 2009).

Regarding claims 1, 2, 26 and 27, as best understood, ‘645 similarly claims a microstructure comprising: a plurality of microchannel walls (e.g., defined by the porous membrane, first plate and second plate; see claim 1) defining at least one microchannel (e.g., a first microchannel and a second microchannel; see claim 1); at least one coating layer adhered to the plurality of microchannel walls defining said at least one microchannel, the coating layer including a catalyst support and a catalyst (e.g., a microporous material comprising a catalyst, which coats the first microchannel, second microchannel and porous membrane; see claims 12 and 13); wherein the plurality of microchannel walls comprise a consolidated fired frit of glass material (see claims 1 and 5; a mesoporous or macroporous membrane made of glass; also, first and second plates made of glass, see claims 1, 4 and 5; e.g., formed by the method of claim 14). ‘645 similarly claims that the at least one of the plurality of microchannel walls further comprises a porous membrane (see claim 1).

Regarding claims 6, the microstructure of ‘645 structurally meets the limitations set forth in this product-by-process claim because the claimed product is the same as, or obvious from, the product of the prior art. The determination of patentability is based on the product itself (i.e., at least one coating layer on at least one microchannel wall), and not its method of production (i.e., by slurry application). If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process. *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985).

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Regarding claims 16-18, 28 and 29, because the microstructure of '645 comprises each of the claimed structural components, the microstructure should, inherently, be capable of operating under an internal pressure within the instantly recited ranges, absent a showing otherwise.

7. Claims 7-9, 14 and 15 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-13 of copending Application No. '645 in view of Haas-Santo et al. (*Preparation of microstructure compatible porous supports by sol-gel synthesis for catalyst coatings*).

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented. '645 fails to claim a plurality of coating layers, including a support layer formed from alumina sol binder and a catalyst layer disposed thereon. Haas-Santo et al., however, teaches a microstructure comprising a plurality of coating layers, including a catalyst support layer formed from an alumina sol, and a catalyst layer disposed thereon (page 91, section 5.4. *Coating a microstructure reactor*). The microstructure reactor may be used for performing a heterogeneously catalyzed reaction employing, e.g., a palladium catalyst. The examiner further takes Official Notice that the selection of the claimed catalyst materials, as appropriate for a particular chemical process, would have been considered conventional to those of ordinary skill in the art. It would have been obvious for one of ordinary skill in the art at the time the invention was made to substitute the coating layers as taught by Haas-Santo et al. for the coating layer in the claimed apparatus of '645, because the alumina sol used for forming the catalyst support exhibits low viscosity and high surface enhancement factors essential for the coating of small channels, and the sol-gel technique of Haas-Santo et al. produces a stable and well sticking, porous thin coating having a high specific surface (page 91, section 6. Conclusion).

Response to Arguments

8. Applicant's arguments with respect to the combination of Tonkovich et al. and Burdon et al. have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the newly discovered prior art, cited above.

9. The provisional obviousness type double patenting rejections, set forth in the previous Office Action, have been maintained because terminal disclaimers have not yet been filed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JENNIFER A. LEUNG whose telephone number is (571) 272-1449. The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter D. Griffin can be reached on (571) 272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jennifer A. Leung/
Primary Examiner, Art Unit 1797